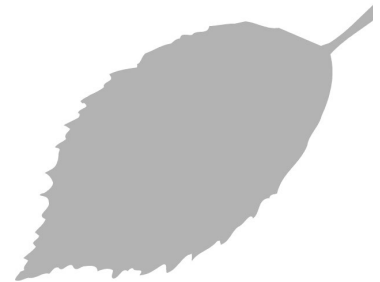


**Massachusetts  
Tests for Educator Licensure<sup>®</sup> (MTEL<sup>®</sup>)**



**General  
Curriculum (03)  
PRACTICE TEST  
APPENDIX:  
Multiple-Choice  
Question Analyses**

**BOOKLET 1  
Multi-Subject Subtest**



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## MULTIPLE-CHOICE QUESTION ANALYSES

1. Which of the following sentences provides an example of agreement between a pronoun and its antecedent?
  - A. Several of the guests had mailed their gifts prior to the party.
  - B. One of the runners was showing their fatigue.
  - C. Each of the officials has worked to protect their own interests.
  - D. Neither of the children likes to share their toys.

**Correct Response: A.** The antecedent of a pronoun is the word to which the pronoun refers. The pronoun must agree with its antecedent in number and person. In the sentence for **A**, the third-person, plural pronoun *their* agrees with its antecedent *several*, which is plural. In the sentences for **B**, **C**, and **D**, the third-person pronoun *their* does not agree with its antecedent (*one*, *each*, and *neither*, respectively), which in every case is singular.

2. Which of the following sentences contains an error in punctuation?
- A. The athlete plays several sports during the school year: baseball, basketball, volleyball, and tennis.
  - B. The movie was fantastic but, I had to leave for a moment to take a telephone call.
  - C. I worked all night long to complete the project; my professor will be impressed with the product.
  - D. Don't you think that it's always a good idea to knock before entering any room?

**Correct Response: B.** The sentence for **B** is a compound sentence; that is, it consists of two main clauses. In a compound sentence, the clauses may be joined by a coordinating conjunction preceded by a comma. In this case, however, the comma incorrectly follows the conjunction *but*. The sentences for **A**, **C**, and **D** show correct use of the colon, semicolon, and apostrophe, respectively.

3. During the fifteenth and early sixteenth centuries in Europe, which of the following was the most significant reason for the increased criticism of organized religion and demand for reform by common people?
- A. the emergence of women as writers and artists
  - B. the development of realism in Renaissance painting
  - C. the beginning of exploration across the Atlantic Ocean
  - D. the widespread printing of the Bible in the vernacular

**Correct Response: D.** The invention of the printing press and the subsequent printing of the Bible in the vernacular instead of Latin made the Bible available to the populace. Common people were able to read and interpret the Bible for themselves. As they did so, they began to scrutinize the teachings of the church and even question the authority of organized religion. Although Renaissance women became increasingly better educated and some emerged as important writers and artists (**A**), their contributions had no direct or significant effect on church reform. Similarly, the development of realism in Renaissance painting (**B**) and transatlantic exploration (**C**), both by-products of the humanist style and thought of the period, did not lead directly to criticism of organized religion.

4. Read the sentences below; then answer the question that follows.

1. Only the teacher studied how to read the language.
2. The teacher only studied how to read the language.
3. The teacher studied only how to read the language.

The position of the word *only* changes the meaning of each of the sentences above. This is an example of a manipulation of which of the following elements of language?

- A. semantics
- B. syntax
- C. phonology
- D. lexicon

**Correct Response: B.** Syntax is the way in which words are put together to form phrases. In English, word order helps reveal the relationships among words. In this case, changing the position of the word *only* in a sentence changes the meaning of the sentence, even though all of the other words in the sentence stay in the same order. Semantics (A) is the study of the meanings of individual words, phonology (C) is the study of speech sounds, and lexicon (D) is the vocabulary of a language.

5. In a biographical approach to literary criticism, which of the following aspects of a novel receives the most attention?
- A. connections to the author's personal history
  - B. assessments of its impact on other authors' work
  - C. references to contemporary cultural and political life
  - D. responses by readers to its major themes and ideas

**Correct Response: A.** One traditional approach to literary criticism involves considering the biography of the author of a work. In the biographical approach, the work is assessed in a historical context and connections are made between the author, the work, and various actions and events unique to the author's personal history. Other critical approaches seek to evaluate a work in terms of its influence on other authors and works (**B**) or of its reflection of the culture and politics of its time (**C**). Still another approach is completely ahistorical, relying instead on the close reading of a work and on individual reader responses to or interpretations of the work (**D**).

6. The themes and story lines of many plays of the Elizabethan age in England most commonly reflect the influence of:
- A. changing perceptions of the world as a result of exploration.
  - B. the model of classical Greek tragedy.
  - C. the religious upheaval in Europe during the previous decades.
  - D. societal changes due to technology.

**Correct Response: B.** In England during the Elizabethan period, many dramatic works were revivals of classical Greek plays. Other works of the period imitated, in particular, the choruses and deeply moralistic verse that were characteristic of Greek tragedy, and they revisited tragic themes related to human jealousy, betrayal, and revenge. Most Elizabethan drama was designed to appeal to the general public and reflect a simple moral scheme; it did not seek to convey any political (A), religious (C), or social (D) ideology.



7. Which of the following influential works of classical Greek literature best represents the descriptive and narrative literary style known as the epic?
- A. Pindar's *Olympian i*
  - B. Euripides' *Medea*
  - C. Sophocles' *Antigone*
  - D. Homer's *The Odyssey*

**Correct Response: D.** An epic is a long narrative poem that chronicles on a grand scale the adventures of a heroic figure, who is often a warrior. One of the best-known examples of the classical Greek epic is Homer's *The Odyssey*, which tells the story of Odysseus, a Greek soldier journeying back to his home after the Trojan War. Pindar's *Olympian i* (A) is a choral ode to a Sicilian ruler; it is a lyric, rather than a narrative, poem. Euripides' *Medea* (B) is a classical Greek tragedy, based on the myth of Jason and Medea. Sophocles' *Antigone* (C) is also a classical Greek tragedy.

8. Which of the following descriptions best illustrates the dramatic form of the comedy?
- A. an allegorical folk play dealing with an individual's actions in life
  - B. a brief, loosely organized set of songs, dances, and satirical skits
  - C. an extravagant production in which physical action and plot dominate
  - D. a lighthearted work with a positive resolution of the primary conflict

**Correct Response: D.** The purpose of a comedy is to amuse or delight the audience, and the action in a comedy usually ends happily. A comedy is not intended to be an allegorical folk play based upon an individual (A), simply a vaudevillian presentation of skits and song and dance performances (B), or an extravagant production dominated by physical action (C).

9. When a writer uses the literary technique of foreshadowing, which of the following will appear in the text?
- A. an alteration of objective facts or reality
  - B. a break in the story to explain something
  - C. a suggestion of events prior to their occurrence
  - D. an abstract concept represented as a person

**Correct Response: C.** In literature, foreshadowing is used to anticipate an action or event that is likely to occur later on in a story by referring to it delicately and indirectly. Figurative language can be used to alter the perception or experience of facts or objects, describing them in terms of something else that is otherwise unrelated (**A**). An aside is used in drama to break from the action and let a character speak to him- or herself in an undertone or to the audience directly, without other characters "hearing" (**B**). Allegory is used to represent abstract concepts as characters (**D**).

- 10. This item has been retired from the practice test.**

11. A fifth-grade teacher wants to use literature to help foster understanding, sensitivity, and tolerance of cultural differences. Which of the following sets of books would best help the teacher reach this goal?
- A. *The High King*, *The View From Saturday*, and *Maniac Magee*
  - B. *Number the Stars*, *Call It Courage*, and *Bud, Not Buddy*
  - C. *The Giver*, *Dear Mr. Henshaw*, and *A Wrinkle in Time*
  - D. *The Witch of Blackbird Pond*, *The Westing Game*, and *Shiloh*

**Correct Response: B.** All three books listed for **B** deal with themes of personal and cultural identity; they have as central characters young people struggling with issues related to other people's ignorance, intolerance, antipathy, and animosity. In each book, though, the central character demonstrates great sensitivity and strength and fights against prejudice and cruelty. For this reason, a fifth-grade teacher would find these books most helpful in fostering sensitivity, understanding, and tolerance in students. Although some of the books listed for **A**, **C**, and **D** might be helpful for fostering sensitivity and understanding (e.g., *Maniac Magee*, *Shiloh*), others, which come from the fantasy and mystery genres (e.g., *The High King*, *The Westing Game*), would not be especially helpful for this purpose.

Read the passage below from the story of *Pecos Bill* (1966); then answer the two questions that follow.

What Bill planned to do was leap from his horse and grab the cyclone by the neck. But as he came near and saw how high the top of the whirling tower was, he knew he would have to do something better than that. Just as he . . . came close enough to the cyclone to feel its hot breath, a knife of lightning streaked down into the ground. It struck there, quivering, just long enough for Bill to reach out and grab it. As the lightning bolt whipped back up into the sky, Bill held on. When he was as high as the top of the cyclone, he jumped and landed astraddle its black, spinning shoulders.

By then, everyone in Texas, New Mexico, Arizona, and Oklahoma was watching. They saw Bill grab hold of that cyclone's shoulders and haul them back. They saw him wrap his legs around the cyclone's belly and squeeze so hard the cyclone started to pant. Then Bill got out his lasso and slung it around the cyclone's neck. He pulled it tighter and tighter until the cyclone started to choke, spitting out rocks and dust. All the rain that was mixed up in it started to fall.

12. The story of *Pecos Bill*, like those of John Henry and Paul Bunyan, represents which of the following literary genres?
- A. myths
  - B. fairy tales
  - C. epics
  - D. tall tales

**Correct Response: D.** A tall tale typically provides a description of outlandish or highly improbable actions or events. In this case, Bill's ride atop a cyclone and attempt to break it like a wild horse is sufficiently outlandish and qualifies the story as a tall tale. Although the tall tale is related to the fairy tale (B) and the epic (C), fairy tales usually contain some element of magic (e.g., charms, spells), while epics usually focus on some great and serious subject (e.g., honor, courage)—neither of which are qualities of the tale of *Pecos Bill*. A myth (A) generally involves supernatural or godlike beings and tends to explain how something came to exist—a distinction that would exclude the tale of *Pecos Bill* as an example.

Read the passage below from the story of Pecos Bill (1966); then answer the two questions that follow.

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13. These paragraphs include examples of which of the following literary devices?
- A. simile
  - B. alliteration
  - C. hyperbole
  - D. metaphor

**Correct Response:** C. Hyperbole (C) is a figure of speech in which emphasis, exaggeration, or overstatement is employed. This passage, like most tall tales, relies heavily on hyperbole (e.g., "They saw him wrap his legs around the cyclone's belly and squeeze so hard the cyclone started to pant"). The passage contains no strong examples of simile (A), alliteration (B), or metaphor (D).

14. Read the poem below, "To the Right Honorable William, Earl of Dartmouth" (1773) by Phillis Wheatley; then answer the question that follows.

Should you, my lord, while you pursue my song,  
Wonder from whence my love of *Freedom* sprung,  
Whence flow these wishes for the common good,  
By feeling hearts alone best understood,  
I, young in life, by seeming cruel fate  
Was snatch'd from *Afric's* fancy'd happy seat:  
What pangs excruciating must molest,  
What sorrows labour in my parent's breast?  
Steel'd was the soul and by no misery mov'd  
That from a father seiz'd his babe below'd.  
Such, such my case. And can I then but pray  
Others may never feel tyrannic sway?

By constructing her poem as an exchange with a specific person, the poet represents freedom and slavery as:

- A. abstract philosophical concepts.
- B. deeply personal experiences.
- C. divinely determined states.
- D. contentious political issues.

**Correct Response: B.** In the poem, Wheatley makes a direct emotional appeal to another individual ("you, my lord"), imploring him to consider her own deeply personal experience of both freedom and slavery. She speaks of "my love" of freedom and "my case" of slavery and her fervent wish that "others may never feel" what she and her parents felt ("pangs," "sorrows," "misery") as their family was ripped apart by slavery. This approach frames the issues of freedom and slavery in a personal light rather than a philosophical (A), spiritual (C), or political (D) one.



15. **Read the excerpt below from "The Raven" (1845), a poem by Edgar Allan Poe; then answer the question that follows.**

Once upon a midnight dreary, while I pondered, weak and weary,  
Over many a quaint and curious volume of forgotten lore—  
While I nodded, nearly napping, suddenly there came a tapping,  
As of some one gently rapping, rapping at my chamber door.  
" 'Tis some visitor," I muttered, "tapping at my chamber door—  
Only this and nothing more."

In this passage, the repetition of similar word sounds creates a mood of:

- A. carefree relaxation.
- B. mounting tension.
- C. cheery optimism.
- D. growing depression.

**Correct Response: B.** In the excerpt, Poe repeats certain word sounds (e.g., "-apping") to create a sense of urgency and mounting tension. The repetition of sounds in the excerpt simulates the insistent "rapping"/"tapping" at the speaker's chamber door. The longer the rapping persists, the greater the anxiety the speaker—and the reader—feels. Because the sounds that Poe chooses to repeat are somewhat menacing, they fail to create a mood of carefree relaxation (A) or cheery optimism (C). Similarly, the insistent nature of the sounds does not create growing depression (D), but growing apprehension.

16. **Read the paragraph below; then answer the question that follows.**

Janik Laskow's new play, *The New Dawn*, tells the story of a young woman who wakes up one morning to find herself the only person on the earth. What I found remarkable was the acting of Leda Hanson. Incredible! Her ability to use expressions and limited speaking to deliver such a powerful performance was absolutely unbelievable. Laskow's writing is wonderfully realistic and Hanson delivered the lines flawlessly. Everyone should see this play. You will not be disappointed by the performance. Get your tickets at the door.

Given the style and content of the above paragraph, which of the following is most likely the intended audience of the author?

- A. readers of a national news magazine
- B. readers of a financial newspaper
- C. readers of a sports magazine
- D. readers of a local weekly newspaper

**Correct Response: D.** The paragraph is a positive and an enthusiastic review of a play, at the end of which the author informs the audience, "Get your tickets at the door." The warm, conversational tone and the fact that the author does not specify where exactly the tickets can be bought (it seems to be understood where) suggest that the paragraph is most likely written for readers of a local weekly newspaper. A cooler, more formal tone would be used in a paragraph for readers of a national news magazine (**A**) or for readers of a financial newspaper (**B**). Nothing in either the description of the play or the assessment of the actor suggests any connection to sports (**C**).

17. In which of the following ways did the late twentieth-century women's movement in the United States differ most from the women's movement of the nineteenth century?
- A. by championing the belief that women were capable of exercising the privileges and responsibilities of citizenship
  - B. by seeking to expand the range of educational opportunities open to women
  - C. by challenging the traditional assumption that women must choose between motherhood and a professional career
  - D. by seeking to enlist women's organizations in the fight for expanded rights

**Correct Response: C.** Compared with participants in the late twentieth-century women's movement, nineteenth-century advocates of women's rights were much more reluctant to challenge the traditional assumption that women must choose between motherhood and a professional career. Many nineteenth-century women who did enter the workforce were unmarried. Nineteenth-century proponents of women's rights did, however, believe that women were able to exercise the responsibilities of citizenship (**A**), as their demands for voting rights clearly indicated. They also hoped to expand the range of educational opportunities open to women (**B**), often arguing that women could not fulfill their maternal duties without an adequate education. And in their efforts to obtain suffrage, nineteenth-century champions of women's rights tried to secure whatever support they could from a wide variety of contemporary women's organizations (**D**).

18. Which of the following best describes the primary reason that major political figures of the early national period decided to replace the Articles of Confederation with the U.S. Constitution?
- A. to resolve growing tensions between the northern and southern states
  - B. to ensure that state governments were based on the principle of popular sovereignty
  - C. to broaden the powers of the national government
  - D. to remove political obstacles to the creation of territorial governments in the West

**Correct Response: C.** A major reason that supporters of the U.S. Constitution believed the Articles of Confederation needed to be replaced was that the government established by the Articles could not tax effectively, was unable to establish a uniform commercial policy for the nation, and lacked the power to force states to obey its rulings. Relations between the northern and southern states (**A**) were relatively amicable at the time. Nor did supporters of the Articles wish to infringe on the rights of states to establish governments based on the principle of popular sovereignty (**B**). As exemplified by the passage of the Northwest Ordinance, the government formed by the Articles was both willing and able to create territorial governments in the West (**D**).

19. From 1848 to 1850, the nonindigenous population of San Francisco rose from fewer than 1,000 to more than 25,000 people. Which of the following was most directly responsible for this population increase?
- A. the gold rush
  - B. railroad construction
  - C. the Mexican War
  - D. Chinese immigration

**Correct Response: A.** Following the discovery of gold in California during the late 1840s, people from all regions of the country flocked to the territory, substantially increasing its population. A transcontinental railroad (**B**) that linked California to eastern regions of the country did not open for through traffic until 1869, and most of the U.S. soldiers who fought in the Far West during the Mexican War (**C**) returned home afterward. While Chinese immigrants to California were also lured by the reports of gold (**D**), their numbers formed only a small part of the increase in San Francisco's population during the late 1840s.

20. Following World War II, the United States faced a new Red Scare based on claims that:
- A. a fuel shortage was inevitable.
  - B. a large number of government workers were communists.
  - C. an economic recession was imminent.
  - D. a growing base of federal power would limit the scope of civil rights.

**Correct Response: B.** A major claim of Senator Joseph McCarthy and other leading figures in the post-World War II Red Scare was that large numbers of communist agents had secured positions in various government agencies, particularly the State Department. Few, if any, people at the time expressed concern about fuel shortages (A). There was also little worry about an imminent recession (C), as the nation was then in the midst of an economic boom that would last until the early 1970s. McCarthy and his supporters wanted to increase—not restrain—the federal government's authority to limit the civil rights of U.S. citizens (D).

21. Which of the following beliefs was dominant in U.S. politics during both the Progressive Era and the New Deal?
- A. The welfare of society should be supported through free-market capitalism.
  - B. The problems of society should be solved through government initiatives.
  - C. The distribution of wealth should be promoted through decreased government.
  - D. The unemployed should be protected through the restriction of immigration.

**Correct Response: B.** Both Progressives and New Dealers strongly believed that government should be used to correct social problems. During the presidential administrations of Theodore Roosevelt, Woodrow Wilson, and Franklin D. Roosevelt, the federal government enacted a wide range of reform measures dealing with abuses of corporate power, labor rights, unemployment, farm poverty, and a host of other matters. Although Progressives and New Dealers sought to uphold capitalism (A), they believed government necessary to curb the excesses of market economies, one of which was a tendency to produce marked inequities in the distribution of wealth (C). Compared with the Progressives, a number of whom were strong proponents of immigration restriction (D), New Dealers were much less concerned about immigration.

22. Which of the following is a fundamental purpose of democratic government?
- A. providing for the common good
  - B. establishing a moral code
  - C. controlling the economy
  - D. establishing a bureaucracy

**Correct Response: A.** A basic purpose of democratic government is to promote the general welfare by protecting individual liberties, supporting public education, and providing for those in need. Democratic governments must be sensitive to the varying religious and philosophical traditions of all their citizens. Establishing a moral code (**B**) that applies to everyone would almost certainly violate the rights and liberties of some of those citizens. Although most democratic governments do regulate some forms of economic activity, any attempt to control the economy (**C**) would require the use of coercive practices at odds with fundamental democratic values. Most modern democratic governments also create some type of bureaucratic apparatus (**D**). Their reason for doing so, however, is not to further democracy but to enhance the operation of government.



23. A piece of legislation is passed by both the U.S. Senate and the House of Representatives, but the president vetoes it. This legislation can still become a law if:
- A. there is an overriding vote by five of the nine members of the Supreme Court.
  - B. the Speaker of the House decides to approve it.
  - C. the majority of the president's cabinet approve it.
  - D. there is an overriding vote by at least two-thirds of both houses of Congress.

**Correct Response: D.** According to Article I, Section 7 of the U.S. Constitution, if two-thirds of both houses of Congress vote to enact a bill following a presidential veto, the measure "shall become a law." Neither Supreme Court justices (A) nor cabinet members (C) have a direct role in the legislative process. As a member of Congress, the Speaker of the House (B) can vote to override a presidential veto, but if two-thirds of both houses do not do so as well, the bill will not become law.

24. Which of the following forms of local self-government is the best example of direct democracy?
- A. council-manager form of city government
  - B. commission form of government
  - C. mayor-council form of city government
  - D. town meeting form of government

**Correct Response: D.** In direct democracies, the people themselves—not their representatives—enact laws and make all major governmental decisions. The town meeting form of government is one of the few political systems that enable citizens to make the laws that govern them. The council-manager (A) and mayor-council (C) forms of government are representative democracies in which elected councils function as the main legislative body. In the commission form of government (B), another example of representative democracy, a small elected commission has the primary law-making responsibility.

25. Which of the following best describes the main function of entrepreneurs in a capitalist economy?
- A. to organize land, labor, and capital for productive purposes
  - B. to maintain stability within different industries
  - C. to coordinate relations among different sectors of the economy
  - D. to moderate fluctuations in the business cycle

**Correct Response: A.** The main function of entrepreneurs in capitalist economies is to combine the factors of production (i.e., land, labor, and capital) in productive ways to create new goods or services. Given the innovative nature of entrepreneurial activity, it is just as likely to disrupt a given industry as it is to maintain stability (**B**). Although entrepreneurs may have occasion to interact with different sectors of the economy, coordinating relations among them (**C**) is not one of their functions. In modern capitalist economies, the fiscal and monetary policies of government, rather than the actions of individual enterprises, are primarily responsible for moderating fluctuations in the business cycle (**D**).

26. In the U.S. judicial system, the primary role of a grand jury is to:
- A. give police officers permission to make an arrest, seizure, or search in response to a suspected crime.
  - B. sentence a defendant if and when that defendant is found guilty of a federal crime.
  - C. decide whether there is probable cause for believing that a defendant has committed a federal crime.
  - D. attempt to get a defendant to plea-bargain to save the time and cost of a trial.

**Correct Response:** C. The primary role of the grand jury in the U.S. judicial system is to review evidence presented by a prosecutor to determine whether there is probable cause in a criminal case to bring an indictment and take the case to trial. Judges, not grand juries, issue warrants for arrests or searches and seizures (A). Likewise, judges are generally responsible for sentencing defendants who have been found guilty of crimes (B), while prosecuting attorneys and defense lawyers normally arrange plea-bargaining agreements (D).

27. Which of the following industries was the first to be transformed by the Industrial Revolution in Great Britain?
- A. textile
  - B. steel
  - C. transportation
  - D. munitions

**Correct Response:** **A.** During the middle of the eighteenth century, the introduction of technological innovations such as the flying shuttle, the spinning jenny, the water frame, and printing machines transformed the British textile industry. By contrast, British manufacturers did not develop a quick and inexpensive process for producing steel (**B**) until the 1850s. In transportation (**C**), the most significant breakthrough was the emergence of railroads, which began in 1825 with the construction of Great Britain's first railway line. Advances in munitions production (**D**) also lagged well behind developments in textiles.

28. Use the list below to answer the question that follows.

- the development of analytical, secular history
- the creation of a naturalistic art style
- the introduction of philosophical dialogue
- the development of systematic logic

The list above best describes the intellectual contributions of which of the following civilizations?

- A. Egypt
- B. Greece
- C. Rome
- D. India

**Correct Response: B.** Ancient Greek scholars developed a new approach to history that emphasized factual reporting and a critical analysis of people's actions and motives. At the same time, Greek artists and sculptors created a naturalistic style that sought to capture the beauty of the human body, and Greek philosophers introduced a form of dialogue that emphasized careful thinking and questioning. The stress that Greek thinkers placed on the use of reason also contributed to the development of systematic logic. Although ancient Egyptian (A) and Indian (D) civilizations made important intellectual contributions of their own—in engineering, religion, and mathematics, for example—they did not match Greek achievements in any of the areas listed in the box. Most Roman advances in these areas (C) were based largely on Greek models.

29. Which of the following was a significant difference between the early civilizations of Mesoamerica and the early civilization of the ancient Near East and China?
- A. Mesoamerican peoples relied on corn, beans, and squash for protein.
  - B. Mesoamerican peoples had large numbers of domesticated animals.
  - C. Mesoamerican peoples made extensive use of metal tools.
  - D. Mesoamerican peoples developed long-distance trade networks.

**Correct Response:** A. Whereas early Mesoamerican peoples relied primarily on corn, beans, and squash for protein, peoples of the ancient Near East and China obtained much of their protein from wheat, rice, millet, barley, and lentils. Mesoamericans had far fewer animals suitable for domestication (B) than did the peoples of the ancient Near East and China. Although Mesoamericans did not make as extensive use of metal tools as peoples of the ancient Near East and China (C), they did employ such implements in their productive activities, and all three civilizations developed long-distance trade networks (D).

30. **Read the passage below; then answer the question that follows.**

During the mid-1930s, farmers in northern Illinois and eastern Iowa became the first U.S. food producers to adopt hybrid corn. Within a decade, the new seeds were being planted by corn growers throughout much of the Midwest. By mid-century, use of the hybrid varieties had spread to nearly all corn-growing areas of the United States and southern Canada.

The passage above best illustrates the meaning of which of the following geographic concepts?

- A. specialization
- B. diffusion
- C. interdependence
- D. acculturation

**Correct Response: B.** Diffusion is the process by which ideas, products, and innovative practices—such as the use of hybrid varieties of corn—spread over geographic areas. Specialization (**A**) is the separation of tasks within a system. Interdependence (**C**) refers to relationships in which two or more groups or societies are dependent upon one another, and acculturation (**D**) is the process by which a culture group adopts the traits of a host society to which it has immigrated.



31. Which of the following accurately describes an important geographic feature of a major region of Massachusetts?
- A. Central Massachusetts receives more rainfall each year than any other region of the state.
  - B. The rolling plains of the Berkshires are fed by numerous streams.
  - C. The wooded hills of southeastern Massachusetts tower over the surrounding landscape.
  - D. The Connecticut River valley has some of the most fertile land in the state.

**Correct Response: D.** Because of its rich soils, created over millennia by the annual flooding of the Connecticut River, the Connecticut River valley has long been the most productive agricultural region of Massachusetts. The Connecticut River valley also tends to receive more rainfall than central Massachusetts (A) or any other region of the state. The Berkshires (B) is a hilly, mountainous region with limited plains, and southeastern Massachusetts (C) is a lowland region, none of whose rounded hills rise very far over the surrounding landscape.

32. A majority of the earth's human inhabitants today live in which of the following types of climates?
- A. cold high-latitude climates
  - B. humid low-latitude climates
  - C. warm mid-latitude climates
  - D. dry low-latitude climates

**Correct Response: C.** About 75% of the world's population lives in the mid-latitude climates located between 20° and 60° north latitude. Within this region, people are more likely to congregate in relatively warm lowland areas than in colder upland areas. Low temperatures and short growing seasons limit the habitability of cold high-latitude climates (**A**), as does the lack of water in dry low-latitude climates (**D**). Compared with warm mid-latitude climates, humid low-latitude climates (**B**) are much less densely inhabited.

33. Which of the following describes a major function of the prime meridian?
- A. It serves as a division line between tropic and temperate zones of climate.
  - B. It provides a starting point for the measurement of longitude.
  - C. It serves as a division line between the Eastern and Western Hemispheres.
  - D. It provides a starting point for the measurement of great circles.

**Correct Response: B.** A vertical line extending from the North Pole to the South Pole and passing through England, Spain, and West Africa, the prime meridian represents zero degrees longitude. It is the starting point for measuring longitude east and west of the line, which is of vital importance for navigation and geopositioning. The prime meridian does not serve as a division line between the tropical and temperate climate zones (A) through which it passes. While the prime meridian, together with its opposite—the 180 degree meridian—is sometimes used to demarcate the Eastern and Western Hemispheres (C), that is not its major purpose, nor is the division of the two hemispheres consistently identified with the prime meridian. Although the prime meridian forms a portion of a great circle, it does not provide a starting point for the measurement of great circles (D).

34. In 1922 Massachusetts began a project to extend the water system that provided potable water to the Greater Boston and Metropolitan West areas of the state. This project led to the creation of which of the following major physical features in Massachusetts?
- A. Lake Quinsigamond
  - B. Quabbin Reservoir
  - C. Knightville Reservoir
  - D. Lake Cochituate

**Correct Response: B.** As the largest body of water in the state, the Quabbin Reservoir is a major physical feature of Massachusetts and a source of water for Boston and 40 other communities in the Greater Boston area. Lake Quinsigamond (A) is a natural body of water situated between Worcester and Shrewsbury in central Massachusetts. It is used primarily for recreational purposes and is not a water supply for Greater Boston. Knightville Reservoir (C) was formed as a flood control measure by the damming of the East Branch of the Westfield River in Huntington, MA. Lake Cochituate (D) in Middlesex County did supply the city of Boston with water for many years, but it was not formed specifically for that purpose, nor is it a major physical feature of the state.

35. Cells with high energy demands, such as muscle cells, often contain several mitochondria. This is because mitochondria are organelles where:
- A. the chemical energy contained in carbohydrates is transformed into a form usable within the cell.
  - B. electrons are stripped from fat molecules and transferred for use in other parts of the cell.
  - C. the potential energy in proteins is transformed into compounds needed for cellular processes.
  - D. atomic nuclei are split into neutrons and protons and the released energy is used in cellular processes.

**Correct Response:** **A.** Mitochondria are rod-shaped organelles that provide cells, and thus the body, with energy. Mitochondria are the site of cellular respiration in which substances, primarily glucose, are converted in the presence of oxygen to adenosine triphosphate (ATP), which provides energy for cellular activities. **B** is incorrect because it does not accurately describe processes that occur within mitochondria to provide cellular energy. **C** is incorrect because the breakdown of proteins is not the preferred pathway for meeting high energy demands. **D** is a not a process that occurs within organelles.

36. Which of the following represents the simplified chemical equation for photosynthesis?

- A. solar energy + H<sub>2</sub>O → CO<sub>2</sub> + O<sub>2</sub> + sugar
- B. minerals + CO<sub>2</sub> + solar energy → sugar + O<sub>2</sub>
- C. H<sub>2</sub>O + sugar + solar energy → CO<sub>2</sub> + O<sub>2</sub>
- D. H<sub>2</sub>O + CO<sub>2</sub> + solar energy → sugar + O<sub>2</sub>

**Correct Response: D.** Photosynthesis is the process by which plants, and some other organisms, use solar energy to convert water (H<sub>2</sub>O) and carbon dioxide (CO<sub>2</sub>) into sugars that can then be used to provide energy to cells. The photosynthetic process gives off oxygen (O<sub>2</sub>) as a waste product. **A** and **C** are incorrect because CO<sub>2</sub> is taken in and not produced during photosynthesis. **B** is incorrect because it shows minerals replacing H<sub>2</sub>O in the reaction.

37. A significant difference between plant and animal cells is that plant cells have:
- A. cellular membranes.
  - B. cell walls.
  - C. cytoplasm.
  - D. ribosomes.

**Correct Response: B.** Both plant and animal cells are eukaryotic in that they have nuclei as well as complex structures enclosed within membranes. Only plant cells, however, have cell walls, a rigid layer outside the cell membrane that provides structural support and protection to the cell. **A** is incorrect because both types of cells have cellular, or plasma, membranes that separate the interior of the cells from the outside environment. Both also contain cytoplasm (**C**) within the cell membranes as well as ribosomes (**D**) that make proteins from amino acids.

38. Maple trees in midlatitude deciduous forests grow leaves in mid-May, shading the forest floor. Herbaceous flowering plants on the forest floor below them begin to grow earlier and bloom in April. This example best illustrates how different species:
- A. occupy separate niches within an ecosystem to avoid competition.
  - B. compete with each other for the same resources.
  - C. mutually benefit from their relationship.
  - D. rely on different resources within the same ecosystem.

**Correct Response: A.** An ecological niche is essentially the place and role occupied by an organism within an ecosystem. In this illustration, the plants on the forest floor flower early in the spring before the trees' leaves can shade them, avoiding competition. **B** is incorrect because the two species are sharing a resource (sunlight) by using it at different times of the year. The two species do not have a mutualistic relationship (**C**) because they do not interact with one another. **D** is incorrect because both species rely on the same, not different, resources within the ecosystem.



39. A vegetable farmer has a problem with a particular type of insect pest. Every month during the growing season, the farmer sprays a pesticide on the vegetables to control the pest. After five years of spraying, the farmer notices that the pesticide has become less effective at controlling the insect pest. This reduction in the pesticide's effectiveness is most likely due to:
- A. the evolution of a mechanism in the insects to break down and excrete the pesticide.
  - B. an increase in the number of eggs laid by each female insect in response to the pesticide exposure.
  - C. the increasing proportion of pesticide-resistant insects that have survived in the population.
  - D. a change in the feeding habits of the insect so as to avoid the highest concentrations of pesticide.

**Correct Response: C.** Pesticide resistance is a common problem that results from an adaptation in which the organisms that are most resistant to a pesticide are the ones most likely to survive and pass along that genetic trait to their offspring. Therefore, the percentage of pesticide-resistant organisms increases with each generation. Pesticide resistance is a much more likely adaptation than the evolution of a new digestive mechanism (**A**), an increase in the number of eggs laid by female insects (**B**), or a significant change in feeding habits (**D**).

40. Most of the chemical bonding that occurs between elements during the formation of molecular compounds results from which of the following?
- A. the exchange or combination of protons within the atomic nuclei of different atoms
  - B. the magnetic attraction between the opposite poles of different types of atoms
  - C. the transfer or sharing of the outermost electrons of two or more atoms
  - D. the electrical attraction between protons and neutrons in two or more different types of atoms

**Correct Response:** C. The most common types of chemical bonds between elements in the formation of compounds are covalent and ionic bonds. Covalent bonds involve the sharing of electrons between molecules and ionic bonds involve the transfer of electrons between molecules. Covalent and ionic bonds do not involve the exchange or combination of protons (A), a magnetic attraction between opposite poles of atoms (B), or an electrical attraction between protons and neutrons in different types of atoms (D).

41. Which of the following explains why a teaspoon of table salt (sodium chloride) dissolved in a cup of hot water does not increase the volume of the water by an amount equal to the volume of the added salt?
- A. The crystal structure of the salt breaks down as it dissolves, decreasing the distance between individual salt particles.
  - B. The ions of sodium and chloride fit between the water molecules, increasing the density of the salt-water solution.
  - C. The addition of the salt decreases the surface tension of the water molecules, increasing the evaporation rate.
  - D. The chloride ions released from salt as it dissolves combine with water molecules, reducing the mass of the dissolved crystals.

**Correct Response: B.** When salt is dissolved in water, it forms sodium ( $\text{Na}^+$ ) and chloride ( $\text{Cl}^-$ ) ions that become essentially surrounded by water molecules. While the volume of the water does not increase, the mass of the solution does, necessarily leading to an increase in density (mass per unit volume). While the crystal structure of the salt breaks down, this does not lead to a decrease in the distance between salt molecules (**A**). **C** is incorrect because adding salt to water tends to increase its surface tension and slow the evaporation rate. The chloride ions released from the salt do not combine with water molecules (**D**), nor is there a decrease in the mass of the salt crystals.

42. Isaac Newton's law of inertia states that an object will continue in its state of rest or motion unless acted upon by an outside force. An object's inertia is directly related to its:
- A. weight.
  - B. momentum.
  - C. mass.
  - D. acceleration.

**Correct Response:** C. Mass is both a measure of the quantity of matter in an object and a measure of an object's resistance to changing its state of motion when acted upon by an outside force. Therefore, the inertia of an object varies directly with the object's mass. **A** is incorrect because weight, while often incorrectly used interchangeably with mass, is the force created when a mass is acted upon by gravity. Momentum (**B**) is the product of mass and velocity and is not directly related to inertia. Acceleration (**D**) is the rate of an object's change in velocity over time and is also not directly related to inertia.

43. The temperature of water in a glass is most directly related to which of the following?
- A. the energy level of the electrons associated with the water molecules
  - B. the strength of attractive forces between the water molecules
  - C. the movement of the water molecules
  - D. the heat generated by the evaporation of water molecules

**Correct Response:** C. Temperature is the measure of the average kinetic (movement) energy of the molecules in a substance. At higher temperatures, the molecules move more rapidly than they do at lower temperatures. The energy level of the electrons (**A**) in water molecules remains relatively constant. The attractive forces between water molecules (**B**), or hydrogen bonds, are relatively weak and do not vary in strength according to temperature. **D** is incorrect because evaporation is a cooling, not a heating, process.

44. Which of the following is the best indication that the water cycle is balanced, with total evaporation and transpiration equaling total precipitation?
- A. The total amount of fresh water on or under the land is equal to the total amount of salt water in the oceans.
  - B. The proportion of total annual precipitation that falls as rain versus the proportion that falls as snow does not change from year to year.
  - C. The total amount of water vapor in the earth's atmosphere remains relatively constant.
  - D. The proportion of water vapor in the atmosphere produced by evaporation is similar to that produced by transpiration.

**Correct Response:** C. One indication that the water cycle is balanced between evaporation/transpiration and precipitation is that the total amount of atmospheric water vapor remains relatively constant, meaning that precipitation amounts offset water vapor added by evaporation and transpiration. **A** is incorrect because the total amount of fresh water on Earth is only about three percent of the total of all water. **B** is incorrect because whether precipitation falls as rain or snow is irrelevant in this context. **D** is incorrect because the proportion of water vapor produced by evaporation is approximately nine times greater than that produced by transpiration.

45. Which of the following is the most significant factor responsible for the physical weathering of rock outcrops in the northeastern United States?
- A. the shaking of rock caused by tectonic movements
  - B. the dissolving of rock by precipitation
  - C. the oxidation of minerals that are found in rock
  - D. the freezing of water in rock fractures

**Correct Response: D.** The cyclical freezing and thawing of water that has seeped into fractures in rock outcrops is known as frost wedging. This process is a major agent of physical weathering in the northeastern United States and other cold climates. As the water in these fractures freezes, it expands and increases the size of the fracture, eventually helping break the rock apart over many years. Tectonic movements (A), such as earthquakes, are relatively rare in the northeastern United States and thus contribute little to rock weathering in that region. Precipitation (B) in the form of acid rain and oxidation of minerals in rocks (C) may result in chemical, but not physical, weathering of rocks.

46. The moon is located between the sun and the earth during new moons and solar eclipses. While new moons occur monthly, solar eclipses are rare. This is because a solar eclipse only occurs:
- A. when the sun, the moon, and the earth are aligned in the same plane.
  - B. during an equinox, when the earth's Northern and Southern Hemispheres receive equal amounts of sunlight.
  - C. when the moon's elliptical orbit brings it closest to the earth.
  - D. during the summer solstice, when the earth's Northern Hemisphere is tilted toward the sun.

**Correct Response: A.** A solar eclipse, as seen from the earth, occurs only when the moon passes between the sun and the earth and all three are on the same plane, causing the sun to seemingly disappear and the daytime sky to darken. A solar eclipse does not occur only during the vernal or autumnal equinox (**B**), when the moon's orbit is closest to the earth (**C**), or during the summer solstice (**D**).



47. Which line of the table below accurately matches a planet with its characteristics?

Line	Planet	Characteristics
1	Venus	The planet closest to the sun, this planet is almost the same size as the earth but lacks an atmosphere and rotates very slowly on its axis.
2	Uranus	The fifth planet from the sun, this is the second-largest planet and has a thick atmosphere that reflects sunlight and causes the planet to shine brightly in the night sky.
3	Jupiter	The planet that is farthest from the sun, this planet is the largest in the solar system and is composed primarily of water vapor and methane gas.
4	Mars	The fourth planet from the sun, this planet has a mass only one-tenth that of the earth and has a thin atmosphere composed mostly of carbon dioxide.

- A. Line 1
- B. Line 2
- C. Line 3
- D. Line 4

**Correct Response: D.** Mars is the fourth planet from the sun, has a mass approximately one-tenth that of the earth, and has a thin atmosphere that is about 95% carbon dioxide. **A** is incorrect because Venus is not the closest planet to the sun. While it is similar in size to the earth and rotates very slowly, Venus has a dense atmosphere of mostly carbon dioxide. **B** is incorrect because Uranus is the seventh, not fifth, planet from the sun. It is the third-largest, not second-largest, planet. Uranus has a relatively thick atmosphere that absorbs red light, making the planet appear blue. **C** is incorrect because Jupiter is not the farthest planet from the sun. While it is the largest planet in the solar system, its atmosphere consists primarily of hydrogen and helium.

48. Annie Jump Cannon was an early twentieth-century astronomer who catalogued the spectra of over 225,000 stars. Her work was invaluable in helping others formulate and test astronomical theories. The work of Annie Jump Cannon demonstrates which of the following aspects of scientific research?
- A. Scientific inquiry relies on careful observations of natural phenomena.
  - B. Scientific progress proceeds more rapidly at some times than at others.
  - C. Scientific research must be validated by peer review.
  - D. Scientific breakthroughs often occur by accident.

**Correct Response: A.** One of the most important aspects of scientific inquiry is the careful observation and documentation of natural phenomena. Annie Jump Cannon carefully observed and categorized the spectra of light emitted from hundreds of thousands of stars, allowing others who followed to build on her work. While scientific progress proceeds at differing rates (**B**), scientific research should be validated by peer review (**C**), and scientific breakthroughs sometimes occur by accident (**D**), all of these are less relevant to the example presented.

49. The development of techniques for creating integrated circuits by etching large numbers of transistors on a small piece of silicon most directly influenced the production of:
- A. inexpensive and extremely powerful lasers.
  - B. superconducting materials for efficient transmission of electricity.
  - C. smaller, faster, and less expensive computers.
  - D. efficient and affordable photovoltaic cells.

**Correct Response: C.** The development of the integrated circuit in the 1950s to replace vacuum tubes led most directly to the development of smaller, faster, and less expensive computers and later devices such as cell phones. While some lasers may be computer controlled, the development of integrated circuits did not lead to less expensive and more powerful lasers (A) or to the development of superconducting materials for electric transmission (B). Similarly, the development of efficient and affordable photovoltaic cells (D) was not significantly related to the development of integrated circuits.

50. During the nineteenth century, scientists recognized that cholera and typhoid were spread through contaminated water supplies. By the early part of the twentieth century, major urban areas in Europe and the United States were almost free of these diseases primarily as a result of the development of:
- A. diagnostic techniques for rapidly identifying infected individuals.
  - B. public-health initiatives focused on sanitizing drinking water and managing sewage.
  - C. broad-spectrum antibiotics capable of curing infected individuals.
  - D. groundwater resources that replaced rivers as the major source of drinking water.

**Correct Response: B.** Cholera and typhoid (or typhoid fever) are both bacterial diseases that spread primarily through food or drinking water contaminated by the wastes of those who have the disease. Improvements in sanitation have nearly eradicated these diseases in the developed world. The ability to diagnose these diseases rapidly (**A**) was not a major factor in preventing their spread. Broad-spectrum antibiotics (**C**) were not used until the mid- to late twentieth century. Groundwater resources (**D**) such as wells were also frequently contaminated by poor sewage management practices and contributed to the spread of cholera and typhoid prior to improvements in sanitation.

51. During the mid-eighteenth century, the naturalist Carolus Linnaeus developed a key that allowed others to distinguish types of organisms that he had previously identified. His early work ordering and identifying organisms is widely seen as providing the foundation for:
- A. the currently accepted approach to scientific research.
  - B. an explanation of evolutionary processes.
  - C. the modern system for classifying species.
  - D. an understanding of the biology of inheritance.

**Correct Response: C.** The taxonomy for classifying organisms that was created by Carolus Linnaeus became the foundation for modern biological nomenclature, the system used to classify all species. While Linnaeus was a scientist of some renown, he was not known for his contributions to current approaches to scientific research (**A**), to the study of evolution (**B**), nor to the biology of inheritance (**D**).

52. The work of Nicolaus Copernicus in astronomy led to a fundamental shift in thinking about the place of humans in the universe. The philosophical importance of Copernicus's work was based on his discovery that:
- A. the planets revolved around the sun, challenging the widely accepted idea that the earth was at the center of the cosmos.
  - B. the solar system was extremely old, challenging religious beliefs of his day concerning the age of the earth.
  - C. the orbit of the planets was elliptical, countering the idea that the planetary orbits were perfectly circular.
  - D. the stars were similar to the sun, challenging the belief in the uniqueness of the solar system.

**Correct Response:** A. Nicolaus Copernicus first proposed the heliocentric model of the solar system, in which the planets revolved around the sun, in the mid-1500s. Until that time it was widely believed that the earth was the center of the cosmos. Copernicus's writings did not focus on the age of the universe (B), the shape of planetary orbits (C), or the similarities between the sun and other stars (D).

53. When engineers design a part for a machine, the design is passed on to the factory where the part will be produced. Depending on what the part will be used for, the engineers specify the extent to which the finished factory part must match the exact dimensions called for in the design. Design criteria that require the finished part to strictly match design specifications would most likely be necessary when the part must:
- A. be mass-produced cheaply and in large quantities.
  - B. last for a long period of time before needing to be repaired or replaced.
  - C. be able to withstand high levels of stress during frequent use.
  - D. interact with other precision parts in a final product.

**Correct Response: D.** When designing precision parts, engineers generally specify engineering tolerances, the permissible limits in variation of specified dimensions. Parts that must interact intricately with other precision parts generally have low tolerance variations so that the parts can function effectively with one another. **A** is incorrect because producing highly precise parts generally increases costs and makes mass production less feasible. **B** and **C** are incorrect because designing a part to last a long time and to withstand high levels of stress is likely to have more to do with the type of materials used than with how closely the part must match the design specifications.

54. For safety reasons, in which of the following investigations would it be most important to wear protective gloves?
- A. planting seeds in soil to determine the effect of soil moisture on the rate of germination
  - B. dissecting owl pellets to determine the feeding habits of owls
  - C. measuring the temperature of a solution to determine the effect of salinity on the freezing point of water
  - D. analyzing the density and hardness of common rock samples collected on a field trip

**Correct Response: B.** Wearing protective latex gloves when dissecting owl pellets can protect the investigator from potentially dangerous microorganisms such as salmonella or hantavirus. While commercially available owl pellets are usually sterilized, wearing gloves is still an appropriate precaution. Protective gloves are generally not necessary when planting seeds in soil (A). Eye protection would be more important than hand protection when measuring the temperature of a saline solution (C) or analyzing the density and hardness of a rock sample (D).



55. Student teams in a science class are determining the amount of salt that can be dissolved in water at 10°C, 25°C, and 40°C. The teacher has asked the students to use three different beakers for making the measurements and then repeat the series of experiments a second time. The primary reason for having the students do the series of experiments twice is to:
- A. improve the reliability of the results of the investigation.
  - B. create a reference set of data that serves as a control.
  - C. remove the potential for human error.
  - D. provide an opportunity to practice the procedure.

**Correct Response: A.** In order for the results of scientific investigations to be valid, they must be reliable. Reliability can be enhanced by ensuring that results are similar when experiments are repeated. In scientific investigations, a control is a sample that is not manipulated by the experimental variable. A set of data (**B**) would not be considered a control in this situation. Repeating the experiments may help improve the precision of observed measurements, but it cannot eliminate the potential for human error (**C**). While repeating the experiments may provide an opportunity to practice the procedure (**D**), this likely would not be the primary reason for doing so.

## ACKNOWLEDGMENTS

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